Journal of Non-Crystalline Solids 153&154 (1993) ix–xv
North-Holland

Contents

Preface vii
Contents ix

Section 1. Structure, experimental

RDFs and Fe–Fe pair correlations in an AlCuFe icosahedral alloy by double isotopic substitution
R. Bellissent, B. Mozer, Y. Calvayrac, D. Gratias and J.W. Cahn 1

Atomic structure of the Al–Pd–Mn icosahedral phase
M. Boudard, M. de Boissieu, C. Janot, G. Heger, C. Beeli, H.U. Nissen, H. Vincent, M. Audier and J.M. Dubois 5

Neutron scattering structural study of AlCuFe quasicrystals using double isotopic substitution
M. Cornier-Quiquandon, R. Bellissent, Y. Calvayrac, J.W. Cahn, D. Gratias and B. Mozer ... 10

Atomic modeling of the different periodicity decagonal phases
T.L. Daulton, K.F. Kelton and P.C. Gibbons 15

Electron diffraction studies of the decagonal phase and its crystal approximants in Al–Ni–Co alloys
K. Edagawa, M. Ichihara, K. Suzuki and S. Takeuchi 19

Diffraction patterns of Al–Cu–Co–(Si): microcrystalline or quasicrystalline phases?
M. Fettweis, P. Launois, F. Dénoyer, R. Reich, J.M. Godard and M. Lambert 24

Structure of Al–Pd–Mn decagonal quasicrystal studied by high-resolution electron microscopy
K. Hiraga 28

Crystallographic characterization of a single quasicrystal of Al–Cu–Fe
X.B. Kan, J.L. Robertson, S.C. Moss, J. Kulik, T. Ishimasa, M. Mori, A. Quivy, D. Gratias, V. Elser and P. Zschack 33

Decagonal approximants
K.H. Kuo 40

Mössbauer effect studies of local Fe environments in crystalline and quasicrystalline Al–Cu–Fe alloys
D.W. Lawther and R.A. Dunlap 45

Mössbauer effect study of the stable $Al_{75}Pd_{15}Fe_{10}$ decagonal quasicrystal
D.W. Lawther and R.A. Dunlap 49

Large unit cell crystal approximant in Ti–Cr–Si alloys
J.L. Libbert, K.F. Kelton, P.C. Gibbons and A.I. Goldman 53

A Mössbauer effect study of the icosahedrally coordinated Ti–Mn–Fe–Si phases
G.J. Long, F. Grandjean, X. Zhang, P.C. Gibbons and K.F. Kelton 58

Diffraction studies of icosahedral phases in the Al–Fe–W system
N.K. Mukhopadhyay, G.C. Weatherly, D.J. Lloyd and J.D. Embury 63

Electron microscopy of near-icosahedral stable Al–Cu–Li quasicrystals
H.-U. Nissen and C. Beeli 68

Investigation of the structure of T-phase $Al_{62}Cu_{20}Co_{15}Si_3$ by fast ion channeling
D. Plachke, T. Kupke, H.D. Carstanjen and R.M. Emrick 72

0022-3093/93/$06.00 © 1993 – Elsevier Science Publishers B.V. All rights reserved

Diffuse scattering in icoshedral phase AlMnSi
J.L. Robertson and S.C. Moss 77
On the local structure in icosahedral AlPdMn quasicrystals
A. Sadoc and J.M. Dubois 83
Quasicrystalline and crystalline phases and their twins in rapidly solidified Al–Mn–Fe alloys
A. Singh and S. Ranganathan 86
Comparative structure analysis of several decagonal phases
W. Steurer 92
Electron diffraction and electron microscope study on decagonal quasicrystals on Al–Ni–Fe alloys
M. Tanaka, K. Tsuda, M. Terauchi, A. Fujiwara, A.P. Tsai, A. Inoue and T. Masumoto 98
High-temperature deformation-induced defects and Burgers vector determination of dislocations in the $Al_{70}Co_{15}Ni_{15}$ decagonal quasicrystal
R. Wang, Y.F. Yan and K.H. Kuo 103
A novel planar defect in icosahedral AlPdMn quasicrystals
M. Wollgarten, H. Lakner and K. Urban 108
High-order crystal approximant structures in Ti–Zr–Ni alloys
X. Zhang and K.F. Kelton 114
A transmission electron microscopy study of interphase dislocations between decagonal quasicrystalline and crystalline phases in $Al_{75}Ni_{10}Fe_{15}$ alloy
Y. Zhuang, Z. Zhang and D.B. Williams 119

Section 2. Structure, theoretical

Tiling of triacontahedra
G. Abramovici 123
Monoclinic $Al_{13}Fe_4$ approximant phase: a link between icosahedral and decagonal phases
J.-N. Barbier, N. Tamura and J.-L. Verger-Gaugry 126
Regular and defective vertex configurations in icosahedral structures
S.I. Ben-Abraham, M. Baake, P. Kramer and M. Schlottmann 132
Refined hierarchy of vertices in icosahedral quasicrystals
S.I. Ben-Abraham, A. Joseph and E. Berman 137
Use of periodic approximants in the structure refinement of icosahedral AlCuFe
E. Cockayne, R. Phillips, X.B. Kan, S.C. Moss, J.L. Robertson, T. Ishimasa and M. Mori 140
An atomic model of Al–Cu–Fe, and its comparison with high-resolution electron microscope images
D.P. DiVincenzo, W. Krakow, P.A. Bancel, E. Cockayne and V. Elser 145
New approaches to the construction of quasicrystals and their cubic approximants
V.E. Dmitrienko 150
Systematic structure refinement of quasicrystals using symmetry-adapted parameters
L. Elcoro, J.M. Perez-Mato and G. Madariaga 155
Matching rules for quasicrystals: the composition–decomposition method
F. Gähler 160
Arcs of diffuse scattering in icosahedral glass models
P.C. Gibbons and K.F. Kelton 165
Current models of decagonal atomic structure
C.L. Henley 172
Octagonal quasicrystal tilings
R. Ingalls 177

Reconstructing the structure factors of the Ammann tilings
M.V. Jarić and S.-Y. Qiu 181
A geometric approach to chemical ordering in icosahedral structures
A. Katz and D. Gratias 187
Planes and rows in quasilattices
T. Kupke, H.-R. Trebin and S. Hoffmann 196
Configurational entropy in random tiling models
R. Mosseri, F. Bailly and C. Sire 201
Transfer-matrix analysis of the canonical-cell model of a quasicrystal
M.E.J. Newman and C.L. Henley 205
Random square–triangle tilings
M. Oxborrow and C.L. Henley 210
The F-type icosahedral phase: tilings and vertex models
Z. Papadopolos, P. Kramer and D. Zeidler 215
On the reconstruction of i(Al–Cu–Li) X-ray structure factors
S.-Y. Qiu and M.V. Jarić 221
A visibility threshold for rational approximants
O. Radulescu and M. Kleman 227
Decagonal phase model with multiple periods and quasiperiodic coincidence lattice
D. Romeu 232
Three-dimensional decagonal structure for AlCoCu alloys as random coincidence networks with Fibonacci spaced lines
D. Romeu, J.L. Aragón, G. Pastor and M. Torres 237
General algorithms for the strip projection method
P.L. Ryder and U. Vogg 243
The E8 lattice and quasicrystals
J.F. Sadoc and R. Mosseri 247
Random tiling approach to the structure of decagonal quasicrystals
M. Shin and K.J. Strandburg 253
The sphere packing problem in quasicrystals
A.P. Smith 258
Structure modeling of realistic quasicrystals by use of interatomic potentials
T. Tei-Ohkawa, K. Edagawa and S. Takeuchi 264
Approximation to the study of quasicrystal–crystal transitions
M. Torres, J.L. Aragón, D. Romeu, I. Jiménez, E. Velázquez and G. Pastor 268
Motion of dislocations in two-dimensional decagonal quasicrystals
H.-R. Trebin, R. Mikulla and J. Roth 272
Interpenetrating pseudo-icosahedral clusters model for quasicrystals and consequences: asymmetry of diffraction peaks and pseudo-inflation rules
J.-L. Verger-Gaugry 276
Atomic model of decagonal quasicrystal approximants and phasons
M. Widom and R. Phillips 282
Point groups for quasiperiodic structures: arithmetically non-equivalent choices for the internal space
F. Wijnands and T. Janssen 288
Why do quasicrystals have sharp diffraction peaks?
J. Wolny 293

Section 3. Electronic properties, experimental

Valence band electronic distributions in quasicrystals
E. Belin and Z. Danhkázi 298
Transport properties of quasicrystalline AlCuFe
R. Haberkern, P. Lindqvist and G. Fritsch 303
Optical properties of quasicrystalline approximant boron-rich solids
A. Hori, K. Kimura, T. Tada, M. Takeda and H. Yamashita 308
Transport and thermodynamic properties near a metal–insulator transition in AlCuFe icosahedral phases
T. Klein, C. Berger, G. Fourcaudot, J.C. Grieco and J.C. Lasjaunias 312
Magnetic properties of decagonal AlCuGeMn quasicrystals
R. Reisser and H. Kronmüller 317
Very high resistivity associated with diamagnetism in the stable AlPdMn quasicrystal
P. Lanco, C. Berger, F. Cyrot-Lackmann and A. Sulpice 325
Magnetothermal analysis of the decagonal phases $Al_{65}Cu_{20}Co_{15}$ and $Al_{70}Ni_{15}Co_{15}$
R. Lück and S. Kek 329
Electronic properties of semimetallic quasicrystals
S.J. Poon 334
Evidence of a wide pseudo-gap in AlCuFe icosahedral alloys
A. Sadoc, E. Belin, Z. Dankhazi and A.M. Flank 338
Electronic properties of icosahedral $Al_{63.5}Cu_{24.5}Fe_{12}$
A. Sahnoune, J.O. Ström-Olsen, Z. Altounian, C.C. Homes, T. Timusk and X. Wu 343
NMR study of the electronic properties of Al–Cu–Fe and Al–Cu–Ru quasicrystals
A. Shastri, F. Borsa, A.I. Goldman, J.E. Shield and D.R. Torgeson 347
Electrical resistivity of single-grained quasicrystals
S. Takeuchi, H. Akiyama, N. Naito, T. Shibuya, T. Hashimoto, K. Edagawa and K. Kimura . . . 353
Specific heat measurements on single-phased AlCuFe quasicrystals
K. Wang, C. Scheidt, P. Garoche and Y. Calvayrac 357
Anisotropic Hall coefficients of $Al_{65}Ni_{20}Co_{15}$ 2D single quasicrystals
Y.-p. Wang, L. Lu and D.-L. Zhang 361
Flicker noise in $Al_{65}Ni_{20}Co_{15}$ 2D quasicrystals
D.-l. Zhang, Y.-p. Wang, L. Lu, F. Ying, X.L. Ma and K.H. Kuo 366

Section 4. Electronic properties, theoretical

Percolation conductivity of Penrose lattices by the transfer-matrix Monte Carlo method
F.V. Babalievski 370
Some physical inferences from the quasicrystalline topology of Penrose lattices
R.A. Barrio and C. Wang 375
Optical conductivity of icosahedral quasicrystals
S.E. Burkov, T. Timusk and N.W. Ashcroft 380
The icosahedral plane-wave model: band-gap creation and band-tail states
A.E. Carlsson 386
Electronic structures in quasicrystals
T. Fujiwara 390
Electronic states of the continuous Schrödinger equation for the Fibonacci chain
D. Joseph, M. Baake and P. Kraumer 394

Possibility of semiconducting quasicrystal in boron-rich solids
K. Kimura, A. Hori, M. Takeda, H. Yamashita and H. Ino 398
Frustrated classical *XY* spin systems in the two-dimensional Penrose tiling
D. Ledue, J. Teillet, J. Carnet and J. Dujardin 403
Gap-labeling properties of the energy spectrum for Fibonacci quasilattices
Y. Liu, X. Fu, W. Deng and S. Wang 408
Electronic properties and the role of d states in stable quasicrystals
D. Mayou, F. Cyrot-Lackmann, G. Trambly de Laissardière and T. Klein 412
Total energies of decagonal models for quasicrystals
R. Phillips and M. Widom 416
Electronic properties of 2D quasicrystals: level spacing distribution and diffusion
C. Sire, B. Passaro and V.G. Benza 420
Magnetic properties of static and phason-disordered Penrose lattices
E.S. Sørensen and M.V. Jarić 425
Anderson model for Hume–Rothery alloys containing transition metals
G. Trambly de Laissardière, D.N. Manh and D. Mayou 430
Renormalization group for Penrose tilings
J.Q. You, J.R. Yan and J.X. Zhong 434
Exact Green's functions of generalized Fibonacci lattices
J.X. Zhong, J.R. Yan and J.Q. You 439

Section 5. Mechanical properties, experimental

Application of quasicrystalline alloys to surface coating of soft metals
J.-M. Dubois, S.S. Kang and Y. Massiani 443
Mechanical properties of quasicrystalline and crystalline phases in Al–Cu–Fe alloys
U. Köster, W. Liu, H. Liebertz and M. Michel 446
Transmission electron microscopy study of defects in Al–Li–Cu quasicrystals
D.P. Yu, W. Staiger and M. Kléman 453

Section 6. Mechanical properties, theoretical

Non-stick quasicrystalline coatings
N. Rivier 458

Section 7. Formation, stability and metallurgy, experimental

Stable decagonal $Al_{70}Mn_{17}Pd_{13}$ quasicrystal
C. Beeli and H.-U. Nissen 463
Plastic deformation in AlCuFe icosahedral phase
L. Bresson and D. Gratias 468
Icosahedral related precipitation at a nanometric scale in a superferritic steel
D. Carron, P. Chemelle, D. Michel, M.J. Hytch and R. Portier 473
The growth of the quasicrystal T2 phase: Al_6CuLi_3
C. Degand, K. Wang and P. Garoche 478
The phase diagram and structures of the ternary AlCuFe system in the vicinity of the icosahedral region
D. Gratias, Y. Calvayrac, J. Devaud-Rzepski, F. Faudot, M. Harmelin, A. Quivy and P.A. Bancel 482

Study of the decagonal phase stability in the Al–Cu–Co–(Si) alloy system
B. Grushko 489

Analysis of factors responsible for the formation of quasicrystalline phases in the Al–Cu–Mn system
S. Maâmar and M. Harmelin 494

Enthalpy of formation of the $Al_{0.63}Cu_{0.25}Fe_{0.12}$ icosahedral phase
N. Saâdi, M. Harmelin, F. Faudot and B. Legendre 500

Phase stabilities in the Al–Cu–Ru system
J.E. Shield, R.W. McCallum, A.I. Goldman, P.C. Gibbons and K.F. Kelton 504

TEM investigations of decagonal and related phases in $Al_{78}Mn_{20}Ge_2$
R.S. Tiwari, N.P. Lalla and O.N. Srivastava 508

Interface stability, growth and morphology of quasicrystals
A.P. Tsai, H.S. Chen, A. Inoue and T. Masumoto 513

Electron microscopy of dislocations in quasicrystals
K. Urban, M. Wollgarten, D. Gratias and Z. Zhang 519

Section 8. Formation, stability and metallurgy, theoretical

Recursive growth of the AlCuLi icosahedral and crystalline phases
J.L. Aragón, D. Romeu, M. Torres and J. Fayos 525

Quantum diagrams, structural models and the prediction of new quasicrystals
K.M. Rabe, J.C. Phillips and P. Villars 530

Molecular dynamics studies of 3D quasicrystals
J. Roth, J. Stadler, R. Schilling and H.-R. Trebin 536

Electronic stability of quasicrystals: application to flux phases
C. Sire 541

Classification, based on energetics, of ideal icosahedral clusters, and building blocks of icosahedral quasicrystals and approximant crystals
N. Tamura and J.-L. Verger-Gaugry 546

Section 9. Dynamics, experimental

Dynamical properties of the AlPdMn icosahedral phase
M. de Boissieu, M. Boudard, H. Moudden, M. Quilichini, R. Bellissent, B. Hennion, R. Currat, A. Goldman and C. Janot 552

A discussion of phason hopping in icosahedral AlFeCu quasicrystals
G. Coddens and R. Bellissent 557

Atomic dynamics of icosahedral $Al_{62}Cu_{25.5}Fe_{12.5}$ and tetragonal $Al_{70}Cu_{20}Fe_{10}$: A comparative study using inelastic neutron scattering
T. Klein, G. Pares, J.-B. Suck, G. Fourcaudot and F. Cyrot-Lackmann 562

Inelastic neutron scattering study of icosahedral AlFeCu quasicrystal
M. Quilichini, B. Hennion and G. Heger 568

Generalized vibrational density of states of icosahedral $Al_{71}Pd_{19}Mn_{10}$
J.-B. Suck 573

Section 10. Dynamics, theoretical

The specific heat capacity of defective vertex configurations in quasicrystals
M. Baake, D. Joseph, J. Roth and M. Schlottmann 578

Lattice dynamics of 3-dimensional tilings modelling icosahedral quasicrystals
J. Los, T. Janssen and F. Gähler 581
Wave behavior in anharmonic Penrose lattices
C. Wang, R. Fuentes, O. Navarro, R.A. Barrio and R.G. Barrera 586

Section 11. Transformations, experimental

Crystal-to-quasicrystal transformations
M. Audier, P. Guyot, M. de Boissieu and N. Menguy 591
On the phase transition mechanism in Al–Cu–Fe: structural analysis of the modulated quasicrystalline and of the microcrystalline states
F. Dénoyer, P. Launois, T. Motsch and M. Lambert 595
Disorder diffuse scattering from decagonal phase alloys
F. Frey and W. Steurer 600
HRTEM study of milling induced phase transition and quasicrystalline formation in $Mg_{32}(Al, Zn)_{49}$ cubic Frank–Kasper phase
B. Bokhonov, I. Konstanchuk, V. Boldyrev and E. Ivanov 606
Positron annihilation study of $Al_{63}Cu_{25}Fe_{12}$ as a function of thermal treatment
D.W. Lawther and R.A. Dunlap 611
Continuous transformation of Al–Cu–Fe quasicrystals by structural modulations
W. Liu and U. Köster 615
Modulated icosahedral Al–Fe–Cu phase: a single-crystal X-ray diffraction study
N. Menguy, M. de Boissieu, P. Guyot, M. Audier, E. Elkaim and J.P. Lauriat 620
Structural variation in the phase $Al_{65}Cu_{20}Co_{15}$ during the transition from the crystalline to the quasicrystalline state
E. Ryba, S. Song and L. Wang 623
Decomposition of the icosahedral phase in $Al_{85-x}Cu_xCr_{15}$
P.L. Ryder and H. Selke 630
Quasicrystals and approximants in the Al–Cu–(Fe, Ru) and Al–Pd–Mn systems
A. Waseda, K. Araki, K. Kimura and H. Ino 635

Section 12. Transformations, theoretical

Modelling the transformation from quasicrystal to crystal
S. Baranidharan, E.S.R. Gopal and V. Sasisekharan 640
Structural transformation and phason dynamics in quasicrystals
Y. Ishii 645
Schur rotations, transitions between quasiperiodic and periodic phases, and rational approximants
P. Kramer, M. Baake and D. Joseph 650
Three-dimensional model of structural transformation from icosahedral to hexagonal structure (μAl_4Mn)
A. Le Lann and C.B. Shoemaker 654
Phason-assisted transition from quasicrystal to multiply twinned crystals
R. Mosseri 658

Author index 663
Subject index 670